ICourse Name: Brain Computer Interaction (BCI)

Total Marks: 20

Duration: 1 hour 30 minutes

Sol1200L0007

**Instructions:**
1. This is a closed book, closed notes exam.
2. Answers must be given in pen. Answers in pencils will not be checked.
3. All Questions are compulsory.
4. Mobile phones and laptops are not allowed. You can use scientific calculators if needed.
5. Clearly mention which question has been answered by writing question no. properly for respective answers.

LTP, LTD,

**Q1.** What are four prominent types of synaptic plasticity observed in the brain? Explain how they serve to modify the effect of a presynaptic spike on the postsynaptic neuron [3] STPP

**Q2.** Suppose a BCI user can select one of two commands, A or B. In prior trials, 30% of the commands selected by the user were the command A. If the likelihood of the current brain signal given command A is 0.6 and given command B is 0.5, what is the posterior probability that the command is A? Which command should the BCI execute and why? [3]

**Q3.** If you are given the choice between using PCA and ICA for analysing brain data, when would you opt for one versus the other? Explain the underlying assumptions that motivate your choice [5]

**Q4.** What are some of the strengths and weaknesses of fMRI compared to EEG? Comment particularly on the spatial and temporal resolution afforded by these two methods. [4]

**Q5.**

(a) Find the Fourier Sine transform of $3e^{-2x}$. [2]

(b) State the Convolution theorem on Fourier transform. [1]

(c) State the Parseval's formula or identity [1]